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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/385,959	08/30/1999	TOSHIHARU YANAGIDA	P99.1318	9858

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EXAMINER

GRAYBILL, DAVID E

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 08/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/385,959

Applicant(s)

YANAGIDA, TOSHIHARU

Examiner

David E. Graybill

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-8 and 10-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-8 and 10-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4-28-5 has been entered.

In the rejections *infra*, reference labels are generally recited only for the first recitation of identical elements.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7, 8, 10, 11, 16 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hayes (6114187), Hotchkiss (2002/0106832) and Behun (5147084).

At column 5, line 23 to column 7, line 48, and column 9, lines 1-35, Hayes discloses the following limitations of independent claim 7:

A method of producing of a semiconductor apparatus, the method comprising the steps of: forming metal ball bumps 3 in direct contact with a circuit pattern of a semiconductor device 1 formed on a semiconductor

substrate 17 in a wafer state; forming a resin film 4 on a circuit pattern forming surface of said semiconductor device so as to seal spaces between said metal ball bumps and to become thinner than a height of the metal ball bumps; cleaning the surfaces of the metal ball bumps projecting out from the resin film; after the cleaning step, forming eutectic solder layers 9 different in composition from the metal ball bumps on the surfaces of the metal ball bumps; after the forming solder layers step, cutting the semiconductor wafer into unit semiconductor chips 1, each semiconductor chip having at least one of said semiconductor device; and after the cutting step, mounting at least one of the semiconductor chips on a mounting "substrate" (not labeled) from a bump forming surface side of the semiconductor chip so as to connect the eutectic solder layers of the semiconductor chip to the mounting substrate "flip-chip fabrication."

To further clarify, in the remarks filed on 4-28-5, applicant admits that Hayes discloses metal ball bumps at column 9, line 62 to column 10, line 9.

In any case, as cited, Hayes discloses forming metal columns 3 in direct contact with the circuit pattern. Furthermore, at paragraphs 33-36, Hotchkiss discloses that metal columns and metal ball bumps are alternatives and equivalents; therefore, it would have been obvious to substitute the metal ball bumps of Hotchkiss for the metal columns of Hayes.

See *In re May* (CCPA) 136 USPQ 208 (It is our opinion that the substitution of Wille's type seal for the cement of Hallauer in Figure 1 would be obvious to persons of ordinary skill in the art from the disclosures of these references, merely involving an obvious selection between known alternatives in the art and the application of routine technical skills.); *In re Cornish* (CCPA) 125 USPQ 413; *In re Soucy* (CCPA) 153 USPQ 816; *Sabel et al. v. The Wickes Corporation et al.* (DC SC) 175 USPQ 3; *Ex parte Seiko Koko Kabushiki Kaisha Co.* (BdPatApp&Int) 225 USPQ 1260; and *Ex parte Rachlin* (BdPatApp&Int) 151 USPQ 56. See also *Smith v. Hayashi*, 209 USPQ 754 (Bd. of Pat. Inter. 1980) (However, there was evidence that both phthalocyanine and selenium were known photoconductors in the art of electrophotography. "This, in our view, presents strong evidence of obviousness in substituting one for the other in an electrophotographic environment as a photoconductor." 209 USPQ at 759.). An express suggestion to substitute one equivalent component or process for another is not necessary to render such substitution obvious. *In re Fout*, 675 F.2d 297, 213 USPQ 532 (CCPA 1982). "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose.... [T]he idea of combining them flows logically from their

having been individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 850, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted). See also In re Crockett, 279 F.2d 274, 126 USPQ 186 (CCPA 1960); Ex parte Quadranti, 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992).

Also, although Hayes discloses mounting at least one of the semiconductor chips on a mounting substrate, Hayes does not appear to explicitly disclose a mounting board substrate.

Nonetheless, as cited supra, Hotchkiss discloses mounting a semiconductor chip 112 on a mounting "board" (not labeled) substrate. In addition, it would have been obvious to combine the process of Hotchkiss with the process of Hayes because it would provide a mounting substrate.

Hayes also does not appear to explicitly disclose mounting the semiconductor chip on the mounting board with the resin film directly contacting the semiconductor chip and not directly contacting the mounting board.

Notwithstanding, at column 3, lines 38-62, column 5, lines 7-12, and column 5, line 41 to column 6, line 15, Behun discloses mounting a semiconductor chip 10 on a mounting board 11 with the resin film 20 directly contacting the semiconductor chip and not directly contacting the mounting board. Furthermore, it would have been obvious to combine the

processes of Behun with the applied prior art because, as taught by Behun, it would facilitate reworkability and heat dissipation.

As cited, Hayes also discloses a process of production of a semiconductor apparatus wherein, in said cleaning step, the surfaces are cleaned by removing components inviting a rise in a connection resistance and a decline in a joint strength at least at a connection interface; in said cleaning step, any resin film components deposited on said bumps are removed; in said cleaning step, oxides on said bump surfaces are removed; in said cleaning step, the cleaning of the surfaces of the bumps is performed by irradiating a laser beam; the metal ball bumps formed in the first step are solder bumps; said solder bumps have a melting point higher than a melting point of said eutectic solder and said eutectic solder layers are comprised of a eutectic solder; and in said forming solder layers step, the eutectic solder layers are formed by a printing method, plating method, or transfer method.

To further clarify the disclosures wherein the surfaces are cleaned by removing components inviting a rise in a connection resistance and a decline in a joint strength at least at a connection interface, and oxides on said bump surfaces are removed, it is noted that these processes are inherent results of the cleaning process of Hayes.

Claims 12, 13 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hayes, Hotchkiss and Behun as applied to claims 7, 8, 10, 11, 16 and 19-21, and further in combination with Nishikawa (6227436) and Denning (6187682).

The combination of Hayes, Hotchkiss and Behun does not appear to explicitly disclose a process of production of a semiconductor apparatus wherein, in said cleaning step, the cleaning of the surfaces of the bumps is performed by plasma cleaning; said plasma cleaning is at least sputter etching by discharge plasma of an inert gas; and the cleaning of the surfaces of the bumps is performed under a reduced pressure atmosphere, an inert gas atmosphere, or a reducing gas atmosphere.

Nevertheless, at column 5, line 62 to column 6, line 67, Nishikawa discloses a process of production of a semiconductor apparatus 1 wherein cleaning of the surfaces of bumps 9 is performed by sputter etching of an inert gas ("argon"). Moreover, it would have been obvious to combine the process of Nishikawa with the process of the applied prior art because it would enable cleaning of the surfaces of the bumps 3.

However, the combination of Hayes, Hotchkiss, Behun and Nishikawa does not appear to explicitly disclose that the sputter etching is by discharge plasma.

Regardless, at column 2, line 66 to column 5, line 50, Denning discloses a process of sputter etching by discharge plasma. Furthermore, it would have been obvious to combine the process of Denning with the process of the applied prior art because it would enable sputter etching.

Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Hayes, Hotchkiss, Nishikawa, Behun and Denning as applied to claims 12, 13 and 17, and further in combination with Okumura (4807021).

The prior art applied to claims 12, 13 and 17 does not appear to explicitly disclose a process of production of a semiconductor wherein said plasma cleaning is at least oxygen plasma treatment and then sputter etching by discharge plasma of an inert gas; and wherein said plasma cleaning is at least oxygen plasma treatment and then sputter etching by discharge plasma of a reducing gas.

However, as cited supra, Denning discloses a process wherein plasma cleaning is sputter etching by discharge plasma of an inert and a reducing gas. Moreover, it would have been obvious to combine the process of Denning with the process of the applied prior art because it would enable cleaning.

Also, at column 5, lines 32-44, Okumura discloses a process of production of a semiconductor apparatus wherein plasma cleaning is at least oxygen plasma treatment. In addition, it would have been obvious to combine the process of Okumura with the process of the applied prior art because it would enable cleaning.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayes, Hotchkiss and Behun as applied to claims 7, 8, 10, 11, 16 and 19-21, and further in combination with Jackson (5068040).

The combination of Hayes, Hotchkiss and Behun does not appear to explicitly disclose wherein, in said cleaning step, the cleaning of the surfaces of the bumps is performed while applying a gas jet to the bumps to peel off the unnecessary components which are then sucked away.

Notwithstanding, at column 4, line 44 to column 5, line 33; and column 7, line 46 to column 8, lines 49, Jackson discloses a process wherein the cleaning of the surfaces of a semiconductor apparatus is performed while applying a gas jet to the apparatus to peel off the unnecessary components which are then sucked away. Additionally, it would have been obvious to combine the process of Jackson with the process of the applied prior art because it would enable cleaning.

Applicant's remarks filed 4-28-5 have been fully considered and are addressed in the rejection *supra*, further addressed *infra*, or have been previously addressed in the record.

Applicant contends that the disclosure of Hayes of metal ball bumps at column 9, line 62 to column 10, line 9 is a teaching away from metal ball bumps.

This contention is respectfully traversed because Hayes, at the most, merely discloses examples and preferred embodiments ("This technique [metal ball bumps] is especially valuable where the pads under column 3 are too close together"), and disclosed examples and preferred embodiments do not constitute a teaching away from a broader disclosure or nonpreferred embodiments. In *re Susi*, 169 USPQ 423 (CCPA 1971). "A known or obvious composition does not become patentable simply because it has been described as somewhat inferior to some other product for the same use." In *re Gurley*, 31 USPQ2d 1130, 1132 (Fed. Cir. 1994). A reference may be relied upon for all that it would have reasonably suggested to one having ordinary skill the art, including nonpreferred embodiments. *Merck & Co. v. Biocraft Laboratories*, 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989). To further clarify, a prior art opinion that a claimed invention is not preferred for a particular limited purpose, does not

preclude utility of the invention for that or another purpose, or even preferability of the invention for another purpose. Moreover, even a teaching away from a claimed invention does not necessarily render the invention patentable. See *Celeritas Technologies Ltd. v. Rockwell International Corp.*, 150 F.3d 1354, 1361, 47 USPQ2d 1516, 1522-23 (Fed. Cir. 1998), where the court held that the prior art anticipated the claims even though it taught away from the claimed invention. "The fact that a modem with a single carrier data signal is shown to be less than optimal does not vitiate the fact that it is disclosed." Similarly, in *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997) applicant argued that the prior art taught away from use of a protective layer for a reflective article having a thickness within the claimed range of "50 to 100 Angstroms." Specifically, a patent to Zehender, which was relied upon to reject applicant's claim, included a statement that the thickness of the protective layer "should be not less than about [100 Angstroms]." The court held that the patent did not teach away from the claimed invention. "Zehender suggests that there are benefits to be derived from keeping the protective layer as thin as possible, consistent with achieving adequate protection. A thinner coating reduces light absorption and minimizes manufacturing time and expense. Thus, while Zehender expresses a

preference for a thicker protective layer of 200-300 Angstroms, at the same time it provides the motivation for one of ordinary skill in the art to focus on thickness levels at the bottom of Zehender's suitable range - about 100 Angstroms - and to explore thickness levels below that range. The statement in Zehender that [i]n general, the thickness of the protective layer should be not less than about [100 Angstroms] falls far short of the kind of teaching that would discourage one of skill in the art from fabricating a protective layer of 100 Angstroms or less. [W]e are therefore not convinced that there was a sufficient teaching away in the art to overcome [the] strong case of obviousness made out by Zehender." See MPEP 2144.05II and MPEP 2145, paragraph X.D..

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

For information on the status of this application applicant should check PAIR:

Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Alternatively, applicant may contact the File Information Unit at (703) 308-2733. Telephone status inquiries should not be directed to the examiner. See MPEP 1730VIC, MPEP 203.08 and MPEP 102.

Any other telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (571) 272-1930. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.
The fax phone number for group 2800 is (703) 872-9306.



David E. Graybill
Primary Examiner
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D.G.
1-Aug-05